DRAINAGE REPORT FOR

TRACT A-3

HUNTERS RUN SUBDIVISION

Prepared for

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I certify this report was prepared under my supervision, and I am a registered professional engineer in the State of New Mexico in good standing.

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DRAINAGE REPORT

LEGAL DESCRIPTION

The Tract of land is located on Zone Atlas page A-13, near the intersection of Ellison Drive and Golf Course Road. The parcel is Tract A-3, of the SEVEN-BAR RANCH, City of Albuquerque, Bernalillo County, New Mexico, filed in the office of the County Clerk of Bernalillo County, New Mexico on October 17, 1989 in Volume C40, Folio 21.

EXISTING CONDITIONS

The land slopes down from the north end to the south end of the lot with a slope variation of 1 to 20%. The runoff mostly drains into the Black Arroyo or the southeast side of the Tract, and then drains into the Calabacillas Arroyo.

The site has off-site flows impacting the site on the west and north. The flows on the west are concentrated at one point. While the flows on the north sheet flow across Seven Bar Loop Road. Sheet 1 of the plans included shows the existing flows that reach the site in the present state.

PROPOSED CONDITIONS

Tract A-3 will be developed in three phases. Phase I will develop 98 lots and include building a portion of Seven Bar Loop Road with the crossing structure across the Black Arroyo.

The project divides the flows allowing a majority of Phase I to drain to an existing 36 inch inlet on the east side of the project that connects to the Black Arroyo (See Sheet 4.5c for the detail of the existing 36" RCP). The Black Arroyo is an existing concrete lined facility that drains to the Calabacillas Arroyo. A complete analysis was performed on the Black Arroyo previously by Bohannan Huston and the results of that study are used in this report. A comparison of the time to peak is shown in the section entitled Black Diversion Channel.

A basin layout is shown on the Drainage Map sheet 1.3 highlighting the various basins and drainage patterns. A portion of Phase I flows and all of Phase II and III flows are collected in the streets and discharged to a storm sewer in Loren Street located along the southern edge of the property. This storm sewer collects the flows and routes these flows between Lots 23 and 24, block 1, in a 20' public drainage easement to the floor of the Calabacillas Arroyo. We are proposing the storm sewer to carry twice the 100-year flow to avoid building an Emergency Spillway.

The flows in Phase III are collected in Stanridge Court and along a 20' public drainage easement to a concrete rundown between Lots 56 and 57, Block 1. These flows then flow down Ashland Street and are collected in the storm sewer in Loren Street.

This report analyzes all three phases. This analysis will verify the runoff rates and volumes under the proposed conditions. We have separated out the narrative to discuss the offsite flows into West flows and those flows impacting the site from the North.

WEST FLOWS

Basin 8 and 4 show the off-site areas that contribute to the off-site flows. We have determined that these flows will continue to follow the natural drainage and have analyzed the flow under fully developed conditions. Basin 8 flows at 147.05 cfs and is joined with Basin 4 contributing 49.75 cfs, totalling 196.80 cfs, the flows will be collected in storm sewer on the west edge of the property and discharge to the Calabacillas Arroyo. A drainage easement on Phase II will be placed on the plat and routed to the arroyo. An outlet taking the flows to the arroyo will be designed during Phase II construction design.

We propose building a desilting pond on Phase II and collecting the flows during the construction of Phase I. The development of Phase II will create the need to divert these waters upstream to the Calabacillas Arroyo. We propose diverting the water in a 20' public drainage easement on the west side of the property, again taking the flow to the Calabacillas Arroyo.

NORTH FLOWS

The area to the north currently sheet flows to Seven Bar Loop Road designated Basin 5. Basin 5, with a runoff of 90.37 cfs (under developed conditions), will drain to the proposed Seven Bar Loop Road. We propose grading north of Seven Bar Loop Road routing the flows to two desilting basin. Flow from these basins will be collected in 36" storm drain down to Seven Bar Loop storm sewer to the Black Arroyo Channel. The storm sewer in Seven Bar Loop Road is being designed for fully developed condition. The outlets from the temporary desilting basin have a greater capacity than the undeveloped flow rates. The desilting ponds which are on Basin 5 and at the Phaseline I and II contain 1.1252 Ac-Ft of water and silt.

Basins 7, 6, and 5A will drain into Ellison Drive where it will drain via surface flow to Black's Diversion Channel and are not part of this report.

ON-SITE DRAINAGE

Basins 1, with a total runoff of 31.34 cfs, will drain via surface flow through a concrete drainage easement on the northeast side of Phase I to Black's Diversion

Channel. Basin 1A will be a future City of Albuquerque Parks and Recreation Park Site. The City would like the park left natural, so it could sheet flow to Black Diversion Channel.

Basin 2 and 3, with a total runoff of 133.49 cfs, drains via surface flow and is collected in a storm sewer. This storm sewer drains through a drainage easement on the south end of Durham Street to the Arroyo De Las Calabacillas channel.

Basin 3, with a runoff of 27.07 cfs, will drain via surface flow through a concrete storm sewer drainage easement between Lots 56 and 57 to Ashland and then from there it will drain via surface flow and storm sewer drainage to the Arroyo De Las Calabacillas channel. The flow from Lots 9, 10, and 11 in Phase III will drain to a concrete lined easement between Phase II and III. This easement will tie to the easement between lots 56 and 57 and drain into Phase II.

Prior to building Phase II, a desilting pond will be placed where the runoff drains into Phase I. Also, a desilting basin will be placed on Phase III prior to construction, where the runoff drains into Phase II. Another desilting pond will be placed on Tract 2-A, where the runoff drains into Calabacillas Arroyo through a 36" RCP. The volume of the ponds are about 1.1252 Ac-Ft (102'x102' and 60'x60' dimensions at top and bottom and with side slopes of 3:1), which more than enough capacity since the pipes from the ponds are designed to carry the fully developed flows.

BLACK DIVERSION CHANNEL

The Black Diversion Channel was completely analyzed under a report prepared by Bohannan Huston. See "The Trails At The Seven Bar South Subdivision". The comments in this section refer to Basins that are shown in that report and have been reproduced on sheet 1.7 included in this report for ease of reference.

From this report, Basins 5A and 5 total a discharge of 124.64 cfs with a peak discharge at 1.5 hour, and is proposed to drain to Black Arroyo channel via a new 36" storm drain pipe connection. According to Bohannan Huston's drainage report for "The Trails At The Seven Bar South Subdivision" the following results were generated (See Section VI for copy of the outputs for the following Hydrographs, and also refer to sheet 1.7 for location points of the analysis.):

Hydrograph #1, TOTAL FLOW AT CONFLUENCE OF BLACK ARROYO AND AT 7-BAR CHANNEL.
Peak discharge Rate = 3657.90 cfs
Peak Occurred At 2.30 Hrs

Hydrograph #2, ROUTED FLOW IN BLACK'S DIVERSION AT 7-BAR ROAD INFLOW.
Peak discharge Rate = 3654.10 cfs
Peak Occurred At 2.30 Hrs

Hydrograph #3, ROUTED FLOW FROM BASINS E AND C AT THE BLACK'S DIVERSION.
Peak discharge Rate = 52.30 cfs
Peak Occurred At 1.50 Hrs

Hydrograph #4, TOTAL FLOW IN BLACK'S DIVERSION AT 7-BAR ROAD INFLOW.
Peak discharge Rate = 3657.90 cfs
Peak Occurred At 2.30 Hrs

Hydrograph # 1 is the total flow at the confluence of Black Arroyo and 7-Bar Channel. Hydrograph # 2 is the result of the Hydrograph # 1 routed approximately 4500 feet at the point where we propose to connect to the channel. Hydrograph # 3 is the routed flow from Basin E and Basin C, from the Bohannan Huston report, at a point where they are to enter the Black's Diversion Channel. Hydrograph # 4 is the result hydrograph from the addition of 2 and 3. Bohannan Houston has added # 3 in the hand-written column to show its relation to the total hydrograph (See attached Location Map for the location of the Hydrograph studies as well as location of the Basins E and C).

Basin 1 with a discharge rate of 31.34 cfs peaking at 1.50 hrs, will drain via an existing 36" storm drain pipe connected to the Black Arroyo channel. Basin 1A being a future park site will sheet flow to Black Diversion Channel.

Based on the results from Hydrograph # 4, total discharge, peaking at 1.5 hour, is 564 cfs at Seven Bar Loop Road. The new flows from our Basins 9, 5, 5A, 5C, and 1 will total the peak discharge of Black's Diversion Channel, at 1.5 hour, to (564 cfs + 155.45 cfs) 719.45 cfs (See Table 1, page 2.2, for peak discharge values and Drainage Map, page 1.3, for Basin locations).

Based upon our analysis, the peak discharge happens 0.8 hours ahead of the peak flow in the channel same as the discharge from Trails at The 7-Bar South Subdivision when it does not affect the Black Diversion channel's capacity.

AGREEMENTS

We have solicited the owner of Tract A-2 and 2A to obtain permission to grade on those properties. These agreements are pending and will be presented to Hydrology upon acceptance of the grading. For the exception of Phase I only the agreement for Tract 2-A will be required. The agreement for Phase II will require permission for the owner of 2-A.

Table 1.

FLOW AND VOLUME SUMMARY FOR 100 YEAR & 10 YEAR FLOW FOR ALL THE BASINS

								INPUT FILE					INPUT FILE			
								1.DAT		10.DAT			1EX.DAT		10EX.DAT	
								PROPOSED					EXISTING			
BASIN	HYMO ID NO.	AREA Ac	AREA Mi^2	LAND TREATMENT B (%)	C (%)	D (%)	Tp HR	Qp(CFS) 100-YR	VOL AC-FT	Qp(CFS) 10-YR	VOL AC-FT	Tp HR	Qp(CFS) 100-YR	VOL AC-FT	Qp(CFS) 10-YR	VOL AC-FT
1	101.1	9.8892	0.015452	31.10	31.10	37.80	0.1333	31.34	1.030	17.47	0.549	0.1429	19.23	0.550	7.14	0.185
1A	101.2	3.2900	0.005141	93.00	–	7.00	0.1333	7.20	0.208	2.99	0.081	0.1333	6.68	0.183	2.52	0.062
2	102.1	31.9579	0.049934	26.91	26.91	46.18	0.1333	106.42	3.586	61.28	1.978	0.1877	50.13	1.777	17.80	0.598
3	103.1	9.6787	0.015123	40.74	40.74	18.52	0.1333	27.07	0.830	13.71	0.394	0.1333	19.62	0.538	7.42	0.181
4	104.1	13.1222	0.020504	15.00	15.00	70.00	0.1333	49.75	1.772	30.83	1.052	0.1333	26.60	0.730	10.06	0.245
5	105.1	23.8377	0.037247	25.25	25.25	49.50	0.1333	80.92	2.751	47.15	1.536	0.1333	48.32	1.326	18.27	0.446
5A	105.2	4.3462	0.006791	10.00	–	90.00	0.1333	17.95	0.665	11.65	0.412	0.1333	8.82	0.242	3.33	0.081
5B	105.3	0.6010	0.000939	10.00	–	90.00	0.1333	2.50	0.092	1.62	0.057	0.1333	1.23	0.033	0.46	0.011
5C	105.4	2.0394	0.003187	10.00	–	90.00	0.1333	8.45	0.312	5.47	0.193	0.1333	4.14	0.113	1.57	0.038
6	106.1	14.9109	0.023298	25.25	25.25	49.50	0.1333	50.62	1.721	29.49	0.961	0.1333	30.23	0.829	11.43	0.279
6A	106.2	0.6313	0.000986	10.00	–	90.00	0.1333	2.62	0.097	1.70	0.060	0.1333	1.29	0.035	0.49	0.012
7	107.1	7.6044	0.011882	25.25	25.25	49.50	0.1333	25.82	0.878	15.05	0.490	0.1333	15.42	0.423	5.83	0.142
7A	107.2	2.8926	0.004520	10.00	–	90.00	0.1333	11.97	0.443	7.75	0.274	0.1333	5.87	0.161	2.22	0.054
8	108.1	38.7970	0.060621	15.00	15.00	70.00	0.1333	147.05	5.239	91.15	3.110	0.1333	78.64	2.158	29.73	0.725
9	109.1	3.8419	0.006003	10.00	–	90.00	0.1333	16.79	0.629	11.12	0.396	0.1333	7.79	0.214	2.95	0.072
9A	109.2	0.3149	0.000492	10.00	–	90.00	0.1333	1.38	0.050	0.92	0.032	0.1333	0.65	0.018	0.24	0.006

Table 2.
CALCULATED FLOW FOR EACH SUBBASIN UNDER BASIN 1 & 2

BASIN	AREA Ac	% AREA	Qp (CFS) 100 – YR	Qp (CFS) 10 – YR
1	9.8892	100.00	31.34	17.42
SUBBASIN				
1–1	3.7590	38.01	11.91	6.62
1–2	3.3745	34.12	10.69	5.94
1–3	2.7557	27.87	8.73	4.85
BASIN 2	31.9579	100.00	106.42	61.28
SUBBASIN				
2–1	1.8086	5.66	6.02	3.47
2–2	10.1811 { 4.2061	31.86 { 13.16	33.9 { 14.01	8.07
2–3	4.1664	13.04	13.87	7.99
2–4	2.8457	8.90	9.48	5.46
2–5	2.4117	7.55	8.03	4.62
2–6	2.9240	9.15	9.74	5.61
2–7	2.8437	8.90	9.47	5.45
2–8	1.8274	5.72	6.09	3.50
2–9	3.7834	11.84	12.60	7.25
2–10	5.1409	16.09	17.12	9.86

TABLE 3
10 – YEAR FLOW

32 F–F STREET SECTION

STREET	SUBBASIN	SECTION	SLOPE	CURB	Qp	Dn	Vn	D*V	Fr	E	D2
TALMADGE	1–1	G–G	2.924%	4"	6.62	0.23	0.32	0.07	0.12	0.23	–
CHANDLER	1–2	H–H	1.307%	4"	17.41	0.36	3.13	1.11	0.93	0.51	–
CHANDLER	1–3	O–O	1.641%	4"	4.85	0.22	2.40	0.54	0.89	0.31	–

32 F–F STREET SECTION

STREET	SUBBASIN	SECTION	SLOPE	CURB	Qp	Dn	Vn	D*V	Fr	E	D2
TALMADGE	2–1	R–R	4.404%	4"	3.47	0.17	3.20	0.54	1.37	0.33	0.25
LAWTON	2–2	M–M	0.905%	4"	11.54	0.33	2.38	0.80	0.73	0.42	–
LAWTON	2–2	E–E	0.600%	4"	11.54	0.35	2.10	0.74	0.62	0.42	–
DURHAM	2–3	P–P	1.000%	4"	9.74	0.31	2.36	0.73	0.75	0.40	–
LOREN	2–4	F–F	1.000%	4"	17.00	0.37	2.86	1.05	0.83	0.49	–
LOREN	2–5	B–B	2.551%	8"	25.80	0.43	4.25	1.82	1.14	0.71	0.51
LOREN	2–5	C–C	0.957%	8"	25.80	0.49	3.28	1.59	0.83	0.65	–
ALCOTT	2–6	Q–Q	0.601%	4"	7.36	0.31	1.82	0.56	0.58	0.36	–
ASHLAND	2–7	D–D	3.273%	4"	26.10	0.35	4.87	1.71	1.45	0.72	0.56
ASHLAND	2–7	D–D	3.273%	8"	26.10	0.41	4.80	1.98	1.32	0.77	0.59
BARRET	2–8	S–S	1.953%	4"	1.75	0.15	1.99	0.30	0.90	0.21	–
BARRET	2–9	N–N	1.500%	4"	7.25	0.26	2.56	0.67	0.88	0.36	–
LOREN	2–10	A–A	2.0%	4"	9.86	0.28	3.08	0.85	1.03	0.42	0.29

24 F–F STREET SECTION

STREET	BASIN	SECTION	SLOPE	CURB	Qp	Dn	Vn	D*V	Fr	E	D2
STAN RIDGE	3	L–L	1.45%	8"	13.71	0.31	4.94	1.55	1.56	0.69	0.55

36 F–F STREET SECTION

STREET	SUBBASIN	SECTION	SLOPE	CURB	Qp	Dn	Vn	D*V	Fr	E	D2
SEVEN BAR	9+5A+5C	I–I	2.222%	8"	28.24	0.45	4.20	1.88	1.11	0.72	0.51
SEVEN BAR	9+5A+5C	K–K	5.220%	8"	28.24	0.39	5.77	2.26	1.62	0.91	0.73
SEVEN BAR	9+5A+5C	T–T	6.556%	8"	28.24	0.38	6.29	2.38	1.80	0.99	0.79
SEVEN BAR	9+5A+5C	U–U	3.273%	8"	28.24	0.43	4.72	2.01	1.27	0.77	0.58

TABLE 4
100 – YEAR FLOW

32 F–F STREET SECTION

STREET	SUBBASIN	SECTION	SLOPE	CURB	Qp	Dn	Vn	D*V	Fr	E	D2
TALMADGE	1–1	G–G	2.924%	4"	11.91	0.28	3.72	1.03	1.25	0.49	0.37
CHANDLER	1–2	H–H	1.307%	4"	31.33	0.41	3.92	1.62	1.07	0.65	0.45
CHANDLER	1–3	O–O	1.641%	4"	8.73	0.27	2.77	0.76	0.93	0.39	–

32 F–F STREET SECTION

STREET	SUBBASIN	SECTION	SLOPE	CURB	Qp	Dn	Vn	D*V	Fr	E	D2
TALMADGE	2–1	R–R	4.404%	4"	6.02	0.20	3.67	0.75	1.43	0.41	0.32
LAWTON	2–2	M–M	0.905%	4"	20.03	0.39	2.96	1.14	0.84	0.52	–
LAWTON	2–2	E–E	0.600%	4"	20.03	0.41	2.60	1.06	0.72	0.51	–
DURHAM	2–3	P–P	1.000%	4"	16.92	0.37	2.86	1.05	0.83	0.49	–
LOREN	2–4	F–F	1.000%	4"	29.51	0.42	3.53	1.49	0.96	0.62	–
LOREN	2–5	B–B	2.551%	8"	45.31	0.51	5.32	2.69	1.32	0.95	0.72
LOREN	2–5	C–C	0.957%	8"	45.31	0.58	4.11	2.40	0.95	0.85	–
ALCOTT	2–6	Q–Q	0.601%	4"	12.79	0.36	2.19	0.79	0.64	0.44	–
ASHLAND	2–7	D–D	3.273%	~~4"~~ 8"	49.14	0.41	6.20	2.56	1.70	1.01	0.81
ASHLAND	2–7	D–D	3.273%	8"	49.14	0.49	6.15	3.01	1.55	1.08	0.86
BARRET	2–8	S–S	1.953%	4"	3.05	0.19	2.28	0.42	0.93	0.27	–
BARRET	2–9	N–N	1.500%	4"	12.60	0.32	2.93	0.93	0.92	0.45	–
LOREN	2–10	A–A	2.0%	4"	17.12	0.33	2.54	0.85	0.77	0.43	–

24 F–F STREET SECTION

STREET	BASIN	SECTION	SLOPE	CURB	Qp	Dn	Vn	D*V	Fr	E	D2
STAN RIDGE	3	L–L	1.45%	8"	27.07	0.38	5.97	2.29	1.70	0.94	0.75

36 F–F STREET SECTION

STREET	SUBBASIN	SECTION	SLOPE	CURB	Qp	Dn	Vn	D*V	Fr	E	D2
SEVEN BAR	9+5A+5C	I–I	2.222%	8"	43.19	0.50	4.97	2.49	1.24	0.89	0.66
SEVEN BAR	9+5A+5C	K–K	5.220%	8"	43.19	0.45	6.42	2.87	1.69	1.09	0.87
SEVEN BAR	9+5A+5C	T–T	6.556%	8"	43.19	0.43	6.98	3.02	1.87	1.19	0.95
SEVEN BAR	9+5A+5C	U–U	3.064%	8"	~~43.19~~ 30.6	0.48	5.47	2.62	1.39	0.94	0.73

ANALYSIS FOR CURB SIZING THE STREETS

See Table 3 (10-year flow) and Table 4 (100-year flow) for street hydraulic calculation summary.

BASIN 1

SUBBASIN 1-1

From Table 3, using a 4" curb, D*V = 0.67 < 6.5 and normal depth = 0.24' and D2 = 0.24' are less than 0.5'. From Table 4, normal depth = 0.30' and D2 = 0.31' are less than 0.51.

Therefore, there is no need of the storm drainage system and a 4" curb will used on this section of the site.

SUBBASIN 1-3

From Table 3, using a 4" curb, D*V = 0.50 < 6.5 and normal depth = 0.24 and D2 = 0.16 are less than 0.5'. From Table 4, normal depth = 0.29 and D2 = 0.21 are less than 0.53.

Therefore, there is no need of the storm drainage system and a 4" curb will used on this section of the site.

SUBBASIN 1-2

Subbasin 1-3 and 1-1 drains through this subbasin totalling the 10-year flow to 17.41 cfs, and 100-year flow to 31.33 cfs.

From Table 3, using a 4" curb, D*V = 1.07 < 6.5 and normal depth = 0.37 and D2 = 0.30 are less than 0.5'. From Table 4, normal depth = 0.42 and D2 = 0.41 are less than 0.51.

Therefore, there is no need of the storm drainage system and a 4" curb will used on this section of the site. A portion of the curb will be 8" curb near the section where the water drains through the sidewalk culvert.

BASIN 2

SUBBASIN 2-1

From Table 3, using a 4" curb, D*V = 0.53 < 6.5 and normal depth = 0.17 and D2 = 0.25 are less than 0.5'. From Table 4, normal depth = 0.21 and D2 = 0.31 are less than 0.51.

Therefore, there is no need of the storm drainage system and a 4" curb will used on this section of the site.

SUBBASIN 2-2

Subbasin 2-1 drains through this subbasin totalling the 10-year flow to 11.54 cfs, and 100-year flow to 20.03 cfs.

From Table 3, using a 4" curb @ section M-M, D*V = 0.95 < 6.5 and normal depth = 0.29 and D2 = 0.32 are less than 0.5'. From Table 4, normal depth = 0.34 and D2 = 0.42 are less than 0.51.

From Table 3, using a 4" curb @ section E-E, D*V = 1.05 < 6.5 and normal depth = 0.37 and D2 = 0.29 are less than 0.5'. From Table 4, normal depth = 0.42 and D2 = 0.40 are less than 0.51.

Therefore, there is no need of the storm drainage system and a 4" curb will used on this section of the site.

SUBBASIN 2-4

Subbasins 2-1 and 2-2 drain through this subbasin totalling the 10-year flow to 17.00 cfs, and 100-year flow to 29.51 cfs.

From Table 3, using a 4" curb, D*V = 1.05 < 6.5 and normal depth = 0.37 and D2 = 0.29 are less than 0.5'. From Table 4, normal depth = 0.42 and D2 = 0.40 are less than 0.51.

Therefore, there is no need of the storm drainage system and a 4" curb will used on this section of the site.

SUBBASIN 2-8

From Table 3, using a 4" curb, D*V = 0.32 < 6.5 and normal depth = 0.15 and D2 = 0.15 are less than 0.5'. From Table 4, normal depth = 0.18 and D2 = 0.18 are less than 0.51.

Therefore, there is no need of the storm drainage system and a 4" curb will used.

SUBBASIN 2-6

Subbasin 2-8 drains through this subbasin totalling the 10-year flow to 7.36 cfs, and 100-year flow to 12.79 cfs.

From Table 3, using a 4" curb, D*V = 0.61 < 6.5 and normal depth = 0.28 and D2 = 0.18 are less than 0.5'. From Table 4, normal depth = 0.34 and D2 = 0.23 are less than 0.51.

Therefore, there is no need of the storm drainage system and a 4" curb will used on this section of the site.

SUBBASIN 2-9

From Table 3, using a 4" curb, D*V = 0.66 < 6.5 and normal depth = 0.26 and D2 = 0.22 are less than 0.5'. From Table 4, normal depth = 0.32 and D2 = 0.28 are less than 0.51.

Therefore, there is no need of the storm drainage system and a 4" curb will used.

SUBBASIN 2-7

Subbasins 2-9 and 3 drain through this subbasin totalling the 10-year flow to 26.10 cfs, and 100-year flow to 49.14 cfs.

From Table 3, using a 4" curb, D*V = 1.40 < 6.5 and normal depth = 0.41 and D2 = 0.81 are less than 0.5'. From Table 4, normal depth = 0.48 is less than 0.51 and D2 = 0.54 which is slightly higher than 0.51. Now check for a 8" curb.

From Table 3, using a 8" curb, D*V = 1.64 < 6.5 and normal depth = 0.48 and D2 = 0.86 are less than 0.5'. From Table 4, normal depth = 0.59 and D2 = 0.54 which are less than 0.85.

A 8" curb will be used. Also four catch basin will set at the end of the street.

SUBBASIN 2-10

From Table 3, using a 4" curb, D*V = 0.85 < 6.5 and normal depth = 0.28 and D2 = 0.29 are less than 0.5'. From Table 4, normal depth = 0.33 and D2 = 0.37 are less than 0.51.

Therefore, there is no need of the storm drainage system and a 4" curb will used.

SUBBASIN 2-5

Subbasins 2-7, 2-9, 2-10 drain through this subbasin totalling the 10-year flow to 25.80 cfs, and 100-year flow to 45.31 cfs.

From Table 3, using a 8" curb at section B-B, D*V = 1.77 < 6.5 and normal depth = 0.44 and D2 = 0.48 are less than 0.5'. From Table 4, normal depth = 0.52 and D2 = 0.68 are less than 0.85.

From Table 3, using a 8" curb at section C-C, D*V = 1.78 < 6.5 and normal depth = 0.42 and D2 = 0.50 are less than 0.5'. From Table 4, normal depth = 0.50 and D2 = 0.73 which are less than 0.85.

A 8" curb will be used. Drop inlets are installed at the end of the this subbasin.

BASIN 3

From Table 3, using a 8" curb, D*V = 4.12 < 6.5 and normal depth = 0.31 and D2 = 0.55 are less than 0.5'. From Table 4, normal depth = 0.38 and D2 = 0.75 which are less than 0.87.

Therefore, there is no need of the storm drainage system and a 8" curb will used.

SEVEN BAR LOOP ROAD

Basin 5A, 5C, and 9 with total Qp-100=43.19 cfs and Qp-10=28.24 cfs is proposed to drain to Seven Bar Loop Road.

From Table 3, for section U-U using a 8" curb, D*V = 2.01 < 6.5 and normal depth = 0.43 is less than 0.5'. From Table 4, normal depth = 0.50 and D2 = 0.66 which are less than 0.99'.

Therefore, there is no need of the storm drainage system and a 8" curb will used.

From Table 3, for section T-T using a 8" curb, D*V = 2.38 < 6.5 and normal depth = 0.38 is less than 0.5'. From Table 4, normal depth = 0.43 and D2 = 0.95 which are less than 0.99'.

Therefore, there is no need of the storm drainage system and a 8" curb will used.

From Table 3, for section K-K using a 8" curb, D*V = 2.26 < 6.5 and normal depth = 0.39 is less than 0.5'. From Table 4, normal depth = 0.45 and D2 = 0.87 which are less than 0.99'.

Therefore, there is no need of the storm drainage system and a 8" curb will used.

From Table 3, for section I-I using a 8" curb, D*V = 1.88 < 6.5 and normal depth = 0.45 is less than 0.5'. From Table 4, normal depth = 0.50 and D2 = 0.66 which are less than 0.99'.

Therefore, there is no need of the storm drainage system and a 8" curb will used.

Based on the analysis of the street capacity there are no need of storm drain system, but we will install catch basins to intercept the flow on seven bar before each entrance to Hunter Run subdivision

See the following diagram for locations of the 4" and 8" curbs.

STREET CAPACITY CALCULATION

The following calculations on the spreadsheet are done using Manning's Equation to get the hydrology analysis of each street section based on the flow, the slope and size of the streets.

$$Q = \frac{1.49}{n} AR^{\frac{2}{3}} S^{\frac{1}{2}}$$

See the following spreadsheet for street hydrology calculations.

FINDING STREET CAPACITY – 32 F–F STREET CROSS–SECTION FOR 8" CURB
SECTION B–B

Q = 1.49/n A (A/P) ^ (2/3) S ^ ½
n = 0.017
SLOPE = 0.02251
R ^ 2/3 = (A/P) ^ 2/3
E = D + V^2/2g
D2 = WATER DEPTH AFTER HYDRAULIC JUMP = D1 / 2 [SQRT(1+8Fr^2)−1]

@Y ≤ 0.125
A1 = 1/2 Y (Y/0.0625) = 8Y^2
P1 = SQRT[Y^2 + $(Y/0.0625)^2$] + Y = SQRT(257Y^2) + Y

Y (FT)	A	P	R^2/3	Q	2Q	Q/A	D+FB	Fr	D*V	E	D2
0.0250	0.01	0.43	0.05	0.05	0.10	10.00	1.58	11.15	0.25	1.58	0.38
0.0500	0.02	0.85	0.08	0.02	0.04	1.08	0.07	0.85	0.05	0.07	0.04
0.0750	0.05	1.28	0.11	0.06	0.13	1.41	0.11	0.91	0.11	0.11	0.07
0.1000	0.08	1.70	0.13	0.14	0.27	1.71	0.15	0.95	0.17	0.15	0.09
0.1250	0.13	2.13	0.15	0.25	0.50	1.98	0.19	0.99	0.25	0.19	0.12

@ 0.125 < Y ≤ 0.405 & Y1 = Y − 0.125
A2 = A1 + 1/2 Y1 (Y1/0.02) + 2Y1 = A1 + 25$Y1^2$ + 2Y1
P2 = P1 + SQRT[$Y1^2$ + $(Y1/0.02)^2$] + Y1 = P1 + SQRT(2501Y^2) + Y1

0.2000	0.42	5.95	0.17	0.92	1.85	2.22	0.28	0.88	0.44	0.28	0.17
0.2500	0.77	8.51	0.20	2.02	4.03	2.63	0.36	0.93	0.66	0.36	0.23
0.3000	1.24	11.06	0.23	3.79	7.57	3.05	0.44	0.98	0.92	0.44	0.29
0.3521	1.87	13.71	0.26	6.49	12.98	3.47	0.54	1.03	1.22	0.54	0.37
0.3869	2.36	15.49	0.29	8.85	17.70	3.75	0.60	1.06	1.45	0.60	0.42
0.4050	2.65	16.41	0.30	10.27	20.55	3.88	0.64	1.08	1.57	0.64	0.45

@ 0.405 < Y ≤ 0.6667 & Y2 = Y − 0.405
A3 = A2 + 16Y2
P3 = P2 + Y2

0.4293	3.03	16.44	0.32	12.90	25.80	4.25	0.71	1.14	1.83	0.71	0.51	*
0.4750	3.76	16.48	0.37	18.45	36.90	4.90	0.85	1.25	2.33	0.85	0.64	
0.5000	4.17	16.51	0.40	21.81	43.62	5.24	0.93	1.31	2.62	0.93	0.71	
0.5061	4.26	16.51	0.41	22.66	45.31	5.32	0.94	1.32	2.69	0.94	0.72	**
0.5500	4.97	16.56	0.45	29.17	58.35	5.88	1.09	1.40	3.23	1.09	0.85	***
0.5950	5.69	16.60	0.49	36.49	72.99	6.42	1.23	1.47	3.82	1.23	0.97	
0.6300	6.25	16.64	0.52	42.62	85.24	6.82	1.35	1.52	4.30	1.35	1.07	
0.6667	6.83	16.67	0.55	49.43	98.85	7.23	1.48	1.56	4.82	1.48	1.18	

@ 0.6667 < Y ≤ 0.87 & Y3 = Y − 0.6667
A4 = A3 + ½ Y3 (Y3/0.02) + 16Y3 = A3 + 25$Y3^2$ + 16Y3
P4 = P3 + SQRT[$Y3^2$ + $(Y3/0.02)^2$] = P3 + SQRT(2501$Y3^2$)

0.7400	8.14	20.34	0.54	57.97	115.93	7.12	1.53	1.46	5.27	1.53	1.20
0.8100	9.64	23.84	0.55	69.11	138.23	7.17	1.61	1.40	5.81	1.61	1.25
0.8300	10.11	24.84	0.55	72.84	145.68	7.20	1.64	1.39	5.98	1.64	1.27
0.8500	10.61	25.84	0.55	76.81	153.62	7.24	1.66	1.38	6.16	1.66	1.29
0.8700	11.12	26.84	0.56	81.03	162.05	7.29	1.69	1.38	6.34	1.69	1.31
0.8900	11.65	27.84	0.56	85.50	170.99	7.34	1.73	1.37	6.53	1.73	1.34

*** Depth times velocity based on the 10–year flow (25.80 CFS) = 1.83 ≤ 6.5 & the depth (0.4293) of the flow is less than 0.5'**

**** Qp = 45.31 CFS**

***** Capacity of the street:**
(D2 = 0.85') = 52.85 CFS > 45.31 CFS

FINDING STREET CAPACITY – 32 F–F CROSS–SECTION FOR 4" CURB

SECTION G–G

$Q = 1.49/n\ A\ R^{(2/3)}\ S^{1/2}$

n = 0.017

SLOPE = 0.02924

$R^{2/3} = (A/P)^{2/3}$

D2 = WATER DEPTH AFTER HYDRAULIC JUMP = $D1/2\ [\text{SQRT}(1+8Fr^2) - 1]$

$E = V^2 / 2g$

@$Y \leq 0.0625$

$A1 = \frac{1}{2}\ Y\ (Y/0.03125) = 16Y^2$

$P1 = \text{SQRT}[Y^2 + (Y/0.03125)^2] + Y = \text{SQRT}(1025Y^2) + Y$

Y (FT)	A	P	R^2/3	Q	Q/A	2Q	D+FB	Fr	D*V	E	D2
0.0100	0.00	0.33	0.0286	0.00	0.43	0.00	0.01	0.75	0.004	0.01	0.01
0.0250	0.01	0.83	0.0528	0.01	0.79	0.02	0.03	0.88	0.019	0.03	0.02
0.0400	0.03	1.32	0.0722	0.03	1.08	0.06	0.06	0.95	0.043	0.05	0.04
0.0550	0.05	1.82	0.0892	0.06	1.33	0.13	0.08	1.00	0.073	0.08	0.06
0.0650	0.07	2.15	0.0997	0.10	1.49	0.20	0.10	1.03	0.096	0.09	0.07

@ $0.0625 < Y \leq 0.333$ & $Y1 = Y - 0.0625$

$A2 = A1 + \frac{1}{2}Y1\ (Y1/0.02) + 2Y1 = A1 + 25Y1^2 + 2Y1$

$P2 = P1 + \text{SQRT}[Y1^2 + (Y1/0.02)^2] + Y1 = P1 + \text{SQRT}(2501Y^2) + Y1$

0.1000	0.17	3.93	0.1223	0.31	1.83	0.62	0.15	1.02	0.182	0.15	0.10	
0.2000	0.79	9.03	0.1976	2.34	2.95	4.69	0.34	1.16	0.590	0.33	0.24	
0.2252	1.03	10.32	0.2151	3.31	3.22	6.62	0.39	1.19	0.724	0.38	0.28	
0.2406	1.19	11.10	0.2256	4.01	3.37	8.02	0.42	1.21	0.811	0.41	0.31	*
0.2759	1.60	12.90	0.2488	5.96	3.72	11.91	0.49	1.25	1.026	0.49	0.37	
0.2950	1.85	13.88	0.2610	7.22	3.90	14.43	0.53	1.27	1.150	0.53	0.40	**
0.3100	2.06	14.64	0.2703	8.32	4.04	16.63	0.56	1.28	1.252	0.56	0.43	
0.3330	2.40	15.82	0.2844	10.20	4.25	20.40	0.61	1.30	1.415	0.61	0.47	

@ $0.333 < Y \leq 0.413$ & $Y2 = Y - 0.333$

$A3 = A2 + 16Y2 + \frac{1}{2}Y2[Y2/(0.08/4.5)] = A2 + 16Y2 + 44.125Y^2$

$P3 = P2 + \text{SQRT}(Y2^2 + [Y2/(0.08/4.5)]^2) = P2 + 56.25Y^2$

0.3343	2.42	15.82	0.2861	10.35	4.28	20.70	0.62	1.30	1.429	0.61	0.47	
0.3450	2.60	15.82	0.2998	11.64	4.48	23.28	0.66	1.34	1.545	0.65	0.51	***
0.3600	2.86	15.86	0.3195	13.67	4.78	27.35	0.71	1.40	1.719	0.71	0.56	
0.3750	3.15	15.92	0.3395	15.98	5.08	31.96	0.77	1.46	1.903	0.77	0.61	
0.3890	3.43	15.99	0.3585	18.40	5.36	36.80	0.83	1.51	2.084	0.83	0.66	
0.5300	7.26	18.00	0.5461	59.29	8.16	118.58	1.56	1.98	4.326	1.56	1.24	

*** Depth times velocity based on the 10–year flow (6.62 CFS) = 0.724 ≤ 6.5**
& the depth (0.2252) of the flow is less than .5'

**** Qp = 11.91 CFS**

***** Capacity of the street:**
(0.2' above the curb height or D2 = 0.51') = 23.28 CFS >> 11.91

FINDING STREET CAPACITY – 36 F–F STREET CROSS–SECITON FOR 8" CURB
SECTION I–I
SEVEN BAR LOOP

$Q = 1.49/n\ A\ (A/P)^{(2/3)}\ S^{1/2}$
n = 0.017
SLOPE = 0.02236
$R^{2/3} = (A/P)^{2/3}$
$Fr = V / \mathrm{SQRT}(32.2\ D),\ D = Y$
$D2 = \text{HYDRAULIC DEPTH AFTER JUMP} = D1/2 * [\mathrm{SQRT}(1 + 8Fr^2) - 1]$
$E = V^2 / 2g + D$
$@Y \leq 0.125$
$A1 = \frac{1}{2} Y (Y/0.0625) = 8Y^2$
$P1 = \mathrm{SQRT}[Y^2 + (Y/0.0625)^2] + Y = \mathrm{SQRT}(257\ Y^2) + Y$

Y (FT)	A	P	R^2/3	Q	2Q	Q/A	D+FB	Fr	D*V	E	D2
0.0250	0.005	0.43	0.05	0.00	0.01	0.68	0.03	0.75	0.02	0.03	0.017
0.0500	0.020	0.85	0.08	0.02	0.04	1.07	0.07	0.84	0.05	0.07	0.040
0.0750	0.045	1.28	0.11	0.06	0.13	1.40	0.11	0.90	0.11	0.11	0.065
0.1000	0.080	1.70	0.13	0.14	0.27	1.70	0.14	0.95	0.17	0.14	0.093
0.1250	0.125	2.13	0.15	0.25	0.49	1.97	0.19	0.98	0.25	0.19	0.122

$@\ 0.125 < Y \leq 0.445\ \ \&\ \ Y1 = Y - 0.125$
$A2 = A1 + \frac{1}{2} Y1 (Y1/0.02) + 2Y1 = A1 + 25Y1^2 + 2Y1$
$P2 = P1 + \mathrm{SQRT}[Y1^2 + (Y1/0.02)^2] + Y1 = P1 + \mathrm{SQRT}(2501Y^2) + Y1$

0.2000	0.416	5.95	0.17	0.92	1.84	2.22	0.28	0.87	0.44	0.28	0.166
0.2315	0.622	7.56	0.19	1.54	3.07	2.47	0.33	0.91	0.57	0.33	0.202
0.2621	0.869	9.12	0.21	2.37	4.74	2.73	0.38	0.94	0.71	0.38	0.241
0.3121	1.374	11.67	0.24	4.32	8.63	3.14	0.47	0.99	0.98	0.47	0.308
0.3621	2.005	14.22	0.27	7.10	14.19	3.54	0.56	1.04	1.28	0.56	0.380
0.3721	2.146	14.73	0.28	7.76	15.53	3.62	0.58	1.05	1.35	0.58	0.395
0.4138	2.788	16.86	0.30	10.98	21.95	3.94	0.65	1.08	1.63	0.65	0.457
0.4450	3.325	18.45	0.32	13.87	27.73	4.17	0.72	1.10	1.86	0.72	0.506

$@\ 0.445 < Y \leq 0.6667\ \ \&\ \ Y2 = Y - 0.405$
$A3 = A2 + 18Y2$
$P3 = P2 + Y2$

0.4471	3.362	18.45	0.32	14.12	28.24	4.20	0.72	1.11	1.88	0.72	0.511	*
0.4680	3.739	18.48	0.34	16.85	33.70	4.51	0.78	1.16	2.11	0.78	0.569	
0.4930	4.189	18.50	0.37	20.34	40.69	4.86	0.86	1.22	2.39	0.86	0.638	
0.5000	4.315	18.51	0.38	21.37	42.73	4.95	0.88	1.23	2.48	0.88	0.658	
0.5016	4.343	18.51	0.38	21.60	43.19	4.97	0.89	1.24	2.49	0.89	0.662	**
0.5250	4.764	18.53	0.40	25.18	50.35	5.28	0.96	1.29	2.77	0.96	0.727	
0.5972	6.064	18.60	0.47	37.54	75.07	6.19	1.19	1.41	3.70	1.19	0.930	
0.6205	6.483	18.63	0.49	41.93	83.86	6.47	1.27	1.45	4.01	1.27	0.997	
0.6667	7.315	18.67	0.54	51.19	102.38	7.00	1.43	1.51	4.67	1.43	1.129	

$@\ 0.125 < Y \leq 0.87\ \ \&\ \ Y1 = Y - 0.6667$
$A4 = A3 + \frac{1}{2} Y3 (Y3/0.02) + 18Y3 = A3 + 25Y3^2 + 18Y3$
$P4 = P3 + \mathrm{SQRT}[Y3^2 + (Y3/0.02)^2] = P3 + \mathrm{SQRT}(2501Y3^2)$

0.7000	7.943	20.34	0.53	55.46	110.93	6.98	1.46	1.47	4.89	1.46	1.148	
0.7068	8.077	20.68	0.53	56.41	112.82	6.98	1.46	1.46	4.94	1.46	1.152	
0.7268	8.487	21.68	0.54	59.37	118.73	6.99	1.49	1.45	5.08	1.49	1.167	
0.7465	8.912	22.67	0.54	62.52	125.04	7.01	1.51	1.43	5.24	1.51	1.183	
0.7665	9.362	23.67	0.54	65.94	131.88	7.04	1.54	1.42	5.40	1.54	1.201	
0.7865	9.832	24.67	0.54	69.60	139.20	7.08	1.56	1.41	5.57	1.56	1.220	
0.8065	10.322	25.67	0.54	73.50	147.00	7.12	1.59	1.40	5.74	1.59	1.241	
0.8700	12.009	28.84	0.56	87.52	175.04	7.29	1.69	1.38	6.34	1.69	1.314	***

*** Depth times velocity based on the 10–year flow (28.24 CFS) = 1.88 ≤ 6.5**
& the water depth=0.4471 are less than 0.5'

**** Qp = 43.19 CFS**

***** Capacity of the street:**
(0.2' above the curb height or Y = 0.87') = 175.04 CFS >> 4.74 CFS

FINDING STREET CAPACITY – 24 F–F STREET CROSS–SECTION FOR 8" CURB
SECTION L–L

$Q = 1.49/n\ A\ (A/P)^{(2/3)}\ S^{1/2}$
n = 0.017
SLOPE = 0.0550
$R^{(2/3)} = (A/P)^{2/3}$
$Fr = V / SQRT(32.2\ D)$
D2 = WATER DEPTH AFTER HYDRAULIC JUMP = $D1/2 * [SQRT(1 + 8*Fr^2) - 1]$
$E = V^2 / 2g$
$@Y \leq 0.125$
$A1 = ½\ Y\ (Y/0.0625) = 8Y^2$
$P1 = SQRT[Y^2 + (Y/0.0625)^2] + Y = SQRT(257Y^2) + Y$

Y (FT)	A	P	R^2/3	Q	Q/A	2Q	D+FB	Fr	D*V	E	D2
0.0250	0.0050	0.43	0.05	0.01	1.06	0.010	0.04	1.18	0.03	0.04	0.03
0.0500	0.0200	0.85	0.08	0.03	1.68	0.067	0.09	1.32	0.08	0.09	0.07
0.0750	0.0450	1.28	0.11	0.10	2.20	0.198	0.15	1.42	0.17	0.15	0.12
0.1000	0.0800	1.70	0.13	0.21	2.67	0.427	0.21	1.49	0.27	0.21	0.17
0.1250	0.1250	2.13	0.15	0.39	3.10	0.774	0.27	1.54	0.39	0.27	0.22

$@\ 0.125 < Y \leq 0.365\ \ \&\ \ Y1 = Y - 0.125$
$A2 = A1 + ½\ Y1\ (Y1/0.02) + 2Y1 = A1 + 25Y1^2 + 2Y1$
$P2 = P1 + SQRT[Y1^2 + (Y1/0.02)^2] + Y1 = P1 + SQRT(2501Y^2) + Y1$

0.2000	0.4156	5.95	0.17	1.44	3.48	2.888	0.39	1.37	0.70	0.38	0.30	
0.2500	0.7656	8.51	0.20	3.15	4.12	6.305	0.51	1.45	1.03	0.51	0.40	
0.3133	1.3880	11.73	0.24	6.86	4.94	13.71	0.69	1.56	1.55	0.69	0.55	*
0.3383	1.6890	13.01	0.26	8.88	5.26	17.75	0.77	1.59	1.78	0.76	0.61	
0.3633	2.0213	14.28	0.27	11.25	5.57	22.50	0.84	1.63	2.02	0.84	0.67	
0.3650	2.0450	14.37	0.27	11.43	5.59	22.85	0.85	1.63	2.04	0.84	0.68	

$@\ 0.365 < Y \leq 0.6667\ \ \&\ \ Y2 = Y - 0.365$
$A3 = A2 + 12Y2$
$P3 = P2 + Y2$

0.3835	2.2664	14.41	0.29	13.54	5.97	27.07	0.94	1.70	2.29	0.93	0.75	**
0.4100	2.5850	14.46	0.32	16.82	6.51	33.63	1.07	1.79	2.67	1.06	0.85	***
0.4500	3.0650	14.54	0.35	22.25	7.26	44.50	1.27	1.91	3.27	1.26	1.01	
0.4750	3.3650	14.59	0.38	25.94	7.71	51.88	1.40	1.97	3.66	1.39	1.11	
0.5000	3.6650	14.64	0.40	29.84	8.14	59.68	1.53	2.03	4.07	1.52	1.21	
0.5250	3.9650	14.69	0.42	33.95	8.56	67.89	1.66	2.08	4.49	1.66	1.31	
0.5500	4.2650	14.74	0.44	38.25	8.97	76.49	1.80	2.13	4.93	1.79	1.41	
0.6667	5.6650	14.97	0.52	60.75	10.72	121.4	2.45	2.31	7.15	2.45	1.87	

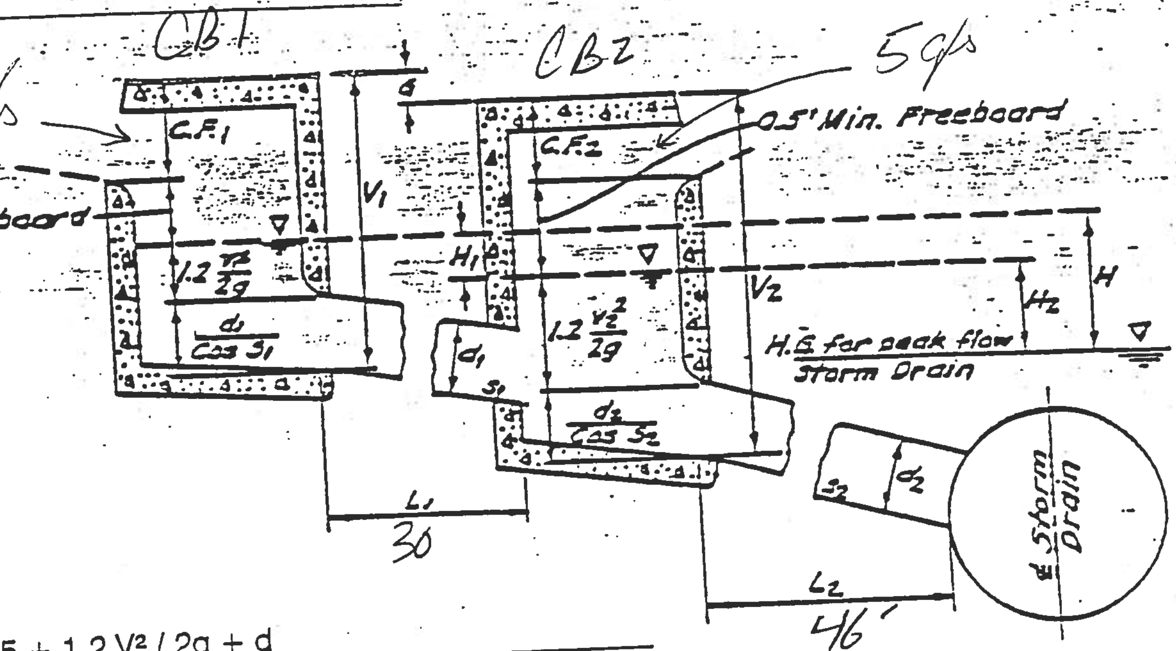
*** Depth time velocity based on the 10–yr flow (13.71 CFS) = 1.55 ≤ 6.5**
& the depth of the flow = 0.3133 < 0.5'

**** Qp = 27.07 CFS**

***** Capacity of the steet:**
@ WATER DEPTH OF 0.85', Q = 33.63 CFS > 27.07

SAMPLE CALCULATION FOR CB Height

CATCH BASINS IN SERIES



$S_1 = 1.70\ \%$
$S_2 = 1.00\ \%$
$d_1 = 1.0'$
$d_2 = 1.5'$
$V_1 = 7.30$
$V_2 = 7.26$

$V1 = C.F. + 0.5 + 1.2\ V^2 / 2g + d$

$V2 = C.F.1 + 0.5 + H1 + 1.2\ V2^2 / 2g + d2 + G$

$H1 = 1.2 / 2g\ (V1^2 - V2^2) + (d1 - d2)$, IF $H1 < 0$ THEN SET $H1 = 0$

$V1 = 1.33 + 1.2\ (7.30)^2 / 64.4 + 1.0$
$= 3.32'$

$H_1 = 0$ $G = 0$
$V2 = 1.33 + 1.2\ (7.26)^2 / 64.4 + 1.50$
$= 3.81'$

SEE Table 6 for all the pipe Flow Calculations

TABLE 6
DRAINAGE PIPES

CONNECTION	PIPE SIZE	LENGTH FT	FLOW DEPTH FT	ACTUAL FLOW CFS	ACTUAL VELOCITY FT/S
EXT. 36" RCP	36" @ 60.00%	27.50	0.48	31.34	42.68
EXT. 36" RCP	36" @ 0.41%	31.50	1.81	31.34	7.03
CB 5A TO CB 5	18" @ 0.70%	30.00	1.16	9.00	6.13
CB 5 TO CB 6	18" @ 3.50%	30.00	1.20	21.00	13.73
CB 6A TO CB 6	18" @ 0.70%	30.00	1.16	9.00	6.13
CB 6 TO MH 2	24" @ 3.00%	46.00	1.62	42.00	15.40
MH 2 TO MH 2A	30" @ 1.00%	245.00	1.94	42.00	10.30
MH 2A TO MH 1	30" @ 1.00%	300.00	1.94	42.00	10.30
CB 1 TO CB 2	12" @ 1.70%	30.00	0.81	5.00	7.30
CB 2 TO MH 1	18" @ 1.00%	46.00	1.09	10.00	7.26
CB3B & 4B TO CB3A & 4A	24" @ 3.00%	1.00	1.42	36.17	15.17
CB3A & 4A TO CB 3 & 4	30" @ 3.50%	1.00	1.80	72.34	19.08
CB3 & 4 TO MH 1	36" @ 2.26%	12.00	2.46	108.50	17.52
MH 1 TO MH 1A	60" @ 0.80%	198.68	2.58	133.49	13.03
MH 1A TO ARROYO	60" @ 0.80%	145.00	2.58	133.49	13.03
MH 1 TO MH 1A	60" @ 0.80%	198.68	4.43	266.98	14.52
MH 1A TO ARROYO	60" @ 0.80%	145.00	4.43	266.98	14.52
CB 9A TO CB 9	18" @ 0.70%	50.00	1.23	9.50	6.14
CB 9 TO CB 10	24" @ 0.65%	34.00	1.62	19.50	7.17
CB 10A TO CB 10	18" @ 0.70%	50.00	1.23	9.50	6.14
CB 10 TO MH 5	30" @ 0.80%	45.00	2.00	39.00	9.23
PONDS TO MH 3&5	36" @ 1.00%	130.00	1.61	40.46	10.51
MH 5 TO MH 4	36" @ 3.00%	329.46	1.70	77.17	18.62
MH 4 TO MH 3	36" @ 3.00%	281.63	1.70	77.17	18.62
CB 7A OT CB 7	18" @ 0.50%	20.00	1.22	8.00	5.19
CB 7 OT CB 8	18" @ 1.70%	34.00	1.19	14.40	9.57
CB 8A OT CB 8	18" @ 0.50%	20.00	1.22	8.00	5.19
CB 8 TO MH 3	24" @ 1.40%	45.00	1.63	28.80	10.52
MH 3 TO MH3A	36" @ 4.40%	200.32	2.07	124.11	23.92
MH 3A TO CHANNEL	36" @ 14.75%	63.25	1.41	124.11	38.16
POND @ BASIN 4 TO THE ARROYO	48" @ 1.40%	320.00	3.59	196.08	16.48

SEE ATTACHED SAMPLE COMPUTER OUTPUT SHEET FOR PIPE FLOW CALCULATION

TABLE 6
DRAINAGE PIPES

CONNECTION	PIPE SIZE	LENGTH FT	FLOW DEPTH FT	ACTUAL FLOW CFS	ACTUAL VELOCITY FT/S
EXT. 36" RCP	36" @ 60.00%	27.50	0.48	31.34	42.68
EXT. 36" RCP	36" @ 0.41%	31.50	1.81	31.34	7.03
CB 5A TO CB 5	18" @ 0.70%	30.00	1.16	9.00	6.13
CB 5 TO CB 6	18" @ 3.50%	30.00	1.20	21.00	13.73
CB 6A TO CB 6	18" @ 0.70%	30.00	1.16	9.00	6.13
CB 6 TO MH 2	24" @ 3.00%	46.00	1.62	42.00	15.40
MH 2 TO MH 2A	30" @ 1.00%	245.00	1.94	42.00	10.30
MH 2A TO MH 1	30" @ 1.00%	300.00	1.94	42.00	10.30
CB 1 TO CB 2	12" @ 1.70%	30.00	0.81	5.00	7.30
CB 2 TO MH 1	18" @ 1.00%	46.00	1.09	10.00	7.26
CB 3 TO MH 1	36" @ 2.26%	12.00	2.46	108.50	17.52
CB 3A TP CB 3	30" @ 1.50%	10.00	2.04	54.25	12.64
CB 4A TP CB 4	30" @ 1.50%	10.00	2.04	54.25	12.64
CB 4 TO MH 1	36" @ 2.26%	12.00	2.46	108.50	17.52
MH 1 TO MH 1A	60" @ 0.80%	198.68	2.58	133.49	13.03
MH 1A TO ARROYO	60" @ 0.80%	145.00	2.58	133.49	13.03
MH 1 TO MH 1A	60" @ 0.80%	198.68	4.43	266.98	14.52
MH 1A TO ARROYO	60" @ 0.80%	145.00	4.43	266.98	14.52
CB 9A TO CB 9	18" @ 0.70%	50.00	1.23	9.50	6.14
CB 9 TO CB 10	24" @ 0.65%	34.00	1.62	19.50	7.17
CB 10A TO CB 10	18" @ 0.70%	50.00	1.23	9.50	6.14
CB 10 TO MH 5	30" @ 0.80%	45.00	2.00	39.00	9.23
PONDS TO MH 3&5	36" @ 1.00%	130.00	1.61	40.46	10.51
MH 5 TO MH 4	36" @ 3.00%	329.46	1.70	77.17	18.62
MH 4 TO MH 3	36" @ 3.00%	281.63	1.70	77.17	18.62
CB 7A OT CB 7	18" @ 0.50%	20.00	1.22	8.00	5.19
CB 7 OT CB 8	18" @ 1.70%	34.00	1.19	14.40	9.57
CB 8A OT CB 8	18" @ 0.50%	20.00	1.22	8.00	5.19
CB 8 TO MH 3	24" @ 1.40%	45.00	1.63	28.80	10.52
MH 3 TO MH3A	36" @ 4.40%	200.32	2.07	124.11	23.92
MH 3A TO CHANNEL	36" @ 14.75%	63.25	1.41	124.11	38.16
POND @ BASIN 4 TO THE ARROYO	48" @ 1.40%	320.00	3.59	196.08	16.48

SEE ATTACHED SAMPLE COMPUTER OUTPUT SHEET FOR PIPE FLOW CALCULATION

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